



NOT TO BE TAKEN FROM THE ROOM  
POUR LA CONSULTATION SUR PLACE

# B I O M E

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## Lucky Strike Helps Student Piece Together the Past

A lucky strike in a Yukon goldfield has helped an Ottawa teenager fit one more piece into the puzzle of the past.

Miners at Gold Run Creek near Dawson City were looking for gold. What they found about eight metres below the surface of

Natalia Rybczynski, with skull of *Equus lambei*.

the frozen tundra was the nearly perfect skull of an extinct Ice Age horse.

Meanwhile, in Ottawa, Natalia Rybczynski was wrapping up a project under a high school mentorship programme. The 16-year-old science student had been chosen to reconstruct the skeleton of *Equus lambei* — a wild horse that roamed the steppes of the Yukon and Alaska more than

10,000 years ago — under the guidance of Dr. Dick Harington, the National Museum of Natural Sciences' chief paleobiologist.

The discovery wasn't the first time prehistoric bones have been found in the Yukon. The arctic cold preserves specimens like a refrigerator, providing scientists with bones that would have decayed in any other climate. The Museum and the Yukon miners have had a

"long and mutually profitable relationship," says Harington. The miners have been keeping their finds for the Museum since 1966; the scientists return the favour by giving the miners background information about their finds.

And although *Equus lambei* was one of the most common Ice Age mammals, this skull was special. It was the most complete skull of the extinct horse ever found. There was rejoicing in the Museum when the donation arrived. It was just the thing Rybczynski needed to complete her skeleton.

Assembling a skeleton isn't glamorous. Working at the back of an echoing collection room where the Paleobiology Division stores its specimens, the grade 11 student spent 130 hours over eight months reconstructing *Equus lambei*.

Harington, who went over the game plan with Rybczynski before she started the project, gave his student top marks. "It takes a lot of patience, persistence and intelligence," he says of her efforts. "She did a job I would expect from a

postdoctoral student. Very few people would have the patience to go through the drudgery."

Harington started Rybczynski with short lessons on horse anatomy, how to measure bones accurately and how to put together a skeleton. The curriculum worked its way up to an understanding of the scientific method: using available information to fill in the blanks of the giant jigsaw puzzle of the past.

A complete skeleton of *Equus lambei* has never been found. Rybczynski had to begin by sifting through the Museum's collection of *Equus lambei* bones, measuring them with calipers and choosing the bones that were closest to the average in size. The final product was a patchwork of all the best matched bones in the Museum's collection. "Measuring was the most tedious part," she says.

Rybczynski ran into another obstacle almost immediately. Researching the background on *Equus lambei* she found that there were few drawings she could follow

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# A Week in the Life of a Curator

The basis of much of my scientific work is describing fish. Tedious counts of fin rays, the number of scales on various portions of a preserved fish and a variety of measurements of body parts must be made. It is not enough to do this on one fish since fish are as variable as humans in their shape, size and other characters. Describing a species may involve hundreds of specimens.

I try to count and measure ten fish a day, which takes two to four hours. Usually, 40 to 50 characters are recorded for each fish. This works out to about 100,000 observations a year, and I count a quarter of a million scales in this period! I only retain a measure of sanity thanks to the excellent radio programmes on the CBC.

This week, the specimens in one jar of fish looked different from those in other jars. The counts and measurements I made confirmed that these represent a species new to science. It is from these descriptions and discoveries that books can be written about the fishes of an area, detailing their characters, mapping their distributions and providing accurate keys for identification. Certainly, you won't have to make thousands of counts and measurements to identify your fish — that is my job.

Fish descriptions are best started early in the morning before phone calls start coming in. Apart from calls from colleagues on various administrative and biological matters, phone calls from the public offer a slice of distracting enter-



tainment. One man wanted to know if there really are fish that can skitter around on land. I assured him that there are and they are called mudskippers. This query was to settle a bet, but I have yet to receive my "cut" from this sort of call. There were no "sick goldfish" or "shark project for school" calls this week. However, one call from a colleague was a little out of the

ordinary. Our sole live fish, George the African lungfish, was on display in the Victoria Memorial Museum Building downtown. This unaccustomed stardom seemed to be having a deleterious effect on him (or her, he may be a Georgina) and the call revolved around the consistency, form, colour and frequency of lungfish bowel movements. What is the cure for a constipated lungfish?

I write several letters or memos each day. These range from a few lines to many pages of closely reasoned analysis of a colleague's scientific writing. This week I replied to letters from Mexico, West Germany, New Zealand, Iraq, Rumania, the U.S.A. and from across Canada. I also gave some thought to preparing a scheduled T.V. lecture on sharks,

read two books and 15 articles, approved and signed invoices and contracts, ensured copies of articles on fishes by our staff were packaged and mailed to hundreds of people in 44 countries, and laboriously proofread articles in progress.

In the laboratory, I identified a number of Canadian freshwater fish for one of our curatorial assistants and a volunteer to catalogue. I asked other curatorial assistants to do various tasks such as obtaining accession numbers for collections received, making photocopies, searching out information in response to public queries and chasing down a student who has loans that should be returned. I discussed certain manuscripts with other staff, as well as our probable budget for the next fiscal year and what we hoped to accomplish, and asked for help when I became entangled with the computer. I gave an albino snake caught by my son to the Curator of Herpetology and helped pacify a man from downstairs who came to us complaining of a leak with a funny smell (one of our fish containers had cracked spontaneously).

The week went well. I didn't get time to go to the Museum library, which is on the other side of the city, so as to keep up on scientific literature, but I did measure my 50 fish, and there were none of those interminable meetings. One day, I hope to get out of the office and go fishing in an official capacity!

Brian W. Coad  
Zoology Division

(continued from page 1)

for the project. Harington suggested that she use their mounted skeleton of *Equus scotti*, a closely related prehistoric horse, as a guide.

Next, she calculated *Equus lambei*'s overall size. With measurements in hand she drew a grid, laying the bones on it as though the horse was standing. Missing bones were replaced with copies fashioned out of modeling clay. The results were photographed from above.

Some of the assembly was calculated guesswork. The Museum

had no *Equus lambei* tail vertebrae and few thoracic vertebrae. Rybczynski based her estimate on the length of *Equus scotti*'s neck vertebrae, then worked out a ratio for the length of *Equus lambei*'s missing vertebrae. Harington checked her work and found that it was accurate to within a few millimetres.

"In science we have to approach the truth as best we can with the evidence we have," says Harington. "If we find a complete specimen, we might be able to correct the present restoration."

From the reconstruction on the grid, Rybczynski drew the skeleton to scale, adding muscles according to modern books on horse anatomy. Her final effort was a drawing of the horse as it may have appeared in nature about 20,000 years ago. Harington says *Equus lambei* probably resembled the Siberian wild ass, a species that still survives.

*Equus lambei* lived during a time of upheaval for life on earth. The Pleistocene epoch saw glaciers grinding over the Northern Hemisphere like mile-high bulldozers. As the glaciers advanced, the waters of the world's oceans fell. This created a land bridge between North America and Asia, allowing animals to migrate between what are now two different continents.

Using this land bridge, wild horses reached Eurasia several million years ago, and there they flourished. Yet in North America they became extinct about 10,000 years ago. Scientists can't pinpoint why *Equus lambei* and several other species of Ice Age horses died out in North America while they thrived in the Old World.

It was thousands of years later that people in the Old World put this North American native to work. Egyptian paintings dating back to 2500 B.C. depict domesticated asses. Other branches of the

horse family — the zebra is an example — have never been domesticated. The Spanish conquistadors accidentally reintroduced the horse to North America more than 400 years ago when their riding horses escaped and went back to the wild.

*Equus lambei* may be gone but Rybczynski helped make sure it isn't forgotten. After she finished assembling the skeleton, the bones were carefully marked and taken apart again. The Museum intends to use the material for a mounted skeleton in a new Life Through the Ages hall.

Last summer, Rybczynski used her paleobiological detective skills for a second project. She reconstructed *Bison priscus*, an extinct steppe bison, then did a painting of it surrounded by plants common in the Ice Age. This time she went one step further and incorporated an eyewitness account. Besides the fossil evidence, Rybczynski borrowed from depictions of steppe bison by European Paleolithic cave dwellers.

Although Rybczynski says she wants to keep her career options open, detective work — of the prehistoric variety — is still in the running. You could say she has paleobiology in her bones.

Joanne Laucius



Natalia drew a grid, laying the bones on it as though the horse was standing.

## BIOME

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# The Bald Eagle

The Bald Eagle (*Haliaeetus leucocephalus*) is a majestic bird. Perhaps for this reason, it has long been a symbol of power and courage.

Despite its "fierce" appearance, the Bald Eagle is a scavenger more than a predator, feeding mainly on dead or dying fish. It will also feed on carrion, and occasionally hunts waterfowl and small mammals.

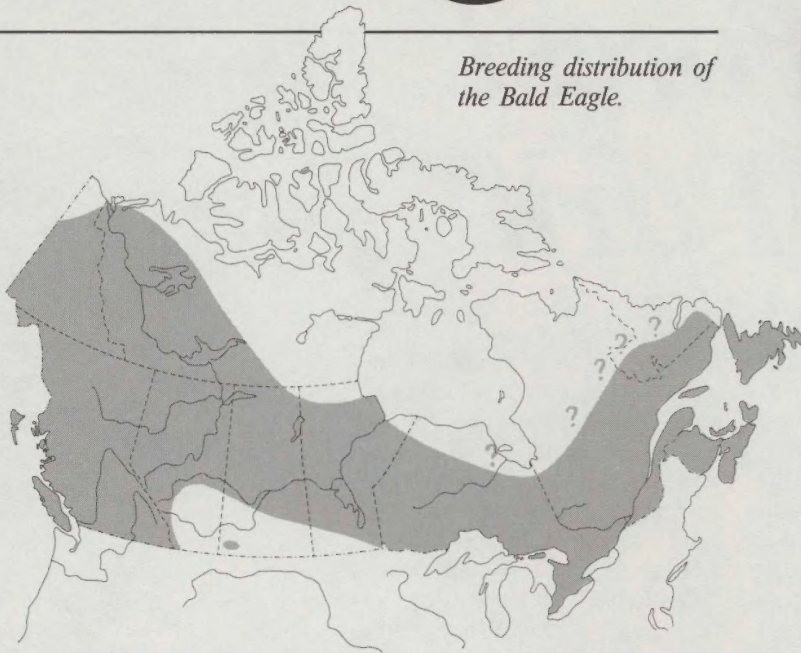
In Canada, Bald Eagles are most common along the Pacific coast and to a lesser degree along the Atlantic coast, but they also breed locally throughout the central and southern regions of the country (except in the southern parts of the Prairie provinces), as well as in the Yukon and the eastern parts of the Northwest Territories. They winter from Alaska, British Columbia and parts of southern Canada, down to the southern United States.

Although the name suggests that this eagle is bald, the head of the adult is actually completely feathered in snowy white. The neck and tail are also white, making it quite distinctive from other birds of prey. The white plumage takes four years to develop fully, and the dark brown colour of an immature Bald Eagle is sometimes confused with that of the Golden Eagle. It can be distinguished by some white flecks and by the fact that its legs are not feathered all the way to the toes. An adult male Bald Eagle is, on the average, 80 cm in length, with a wingspan of 192 cm. Females are larger, averaging 92 cm in length, with a wingspan of 211 cm. The strong feet have sharp, curved talons for clutching and holding prey. The voice, out of keeping with the size of the bird, is weak and halting.

Bald Eagles mate for life and return to the same eyrie (nest) each year. The eyrie, built of a mass of sticks and lined with grasses, moss, weeds, bits of garbage, earth and down, is often enormous and very solid. It may be over a metre deep and wide enough that a grown man could lie across it and be completely hidden from view. One such structure weighed close to two tonnes! Eyries, which are added to and improved each spring, are almost always built near water, often wedged between two branches of a tree as high as 24 m from the ground. In some areas, the rocky ledges of cliffs provide nesting sites.

The white oval-shaped eggs, usually two, are relatively small for so large a bird. Both parents share in incubating the eggs, which takes 35 days, and in caring for the young during the 10 weeks that they spend in the eyrie.

As the eaglets grow, their large nest becomes a training ground where they acquire more and more of the skills necessary for their independence. They are taught to tear up their food and stretch and flap their wings. As they increase in strength, they begin to fly from the eyrie, and soon are able to soar and hover for minutes before landing in the safety of their home. Eventually, they accompany their parents in search of food, but



Breeding distribution of the Bald Eagle.

return to the eyrie until the end of the summer, when they are driven away by the parents.

Although Bald Eagles are often harassed by crows and smaller birds when they come too near their nests, their only real enemy is man.

The wide use of toxic pesticides in the 1950s, pollution and urbanization have caused their numbers to decline alarmingly.

Carol Thiessen  
Exhibits Division



## Earth Swallows Shark

September 1984

The Health Department was adamant. The shark had to go. It was a menace to the neighbourhood.

The head and fins of the enormous fish had been sitting for several days in the back of a truck — unrefrigerated — in a parking lot of the National Museum of Natural Sciences. The stench was getting unbearable.

The 10 m, 1200 kg basking shark had been found by fishermen near Trinity Bay, Quebec. The head and fins were chopped off and shipped to the Museum for identification and storage.

The Museum's Ichthyology Section was pleased with the acquisition, but not quite sure what to do with it. The head and fins alone made up 450 kg — too big to pickle and they wouldn't fit in the fridge.

As the week wore on, the situation became increasingly desperate. Museum staff searched frantically for some way to deep six the shark. Sylvie Laframboise, Ichthyology Curatorial Assistant, finally tracked down a berth for the fish in a commercial freezer in Hull.

There it lay until...

July 1988

The cost of keeping the shark on ice was adding up. The Museum decided that it had better things to do with taxpayers' money.

But once again, disposal was difficult. Dr. Brian Coad, Curator of Ichthyology, says "It's not just something you can pitch out in the garbage." The Museum got the permission of the National Capital Commission to give the shark a

decent burial in the Mer Bleue Conservation Area in Gloucester. Michèle Steigerwald, Ichthyology Curatorial Assistant, made the necessary arrangements for transporting the shark and burying it at the site.

After 'basking' outside over a long hot weekend, the still partially frozen fish was laid out in a sandpit for casting. Ron Séguin, Head of the Display Preparation Section, led the team of five Museum staff, including Grant Latus and Doug Watson, and volunteers in making moulds of the shark parts.

Séguin says a complete carcass, although ideal as reference, wasn't essential for modelling purposes. He says that sea creatures tend to lose their shape when they are taken out of their natural element. "It's like taking a balloon full of water and dumping it out — it just collapses." When the final model is made, the 6 m missing from the body can easily be reconstructed.

As the casting operation proceeded, the heat began to take its toll on both the specimen and the staff. Séguin says that when the work was finished four days later, the team had no regrets about leaving the shark to the backhoe. "We were all glad to see it go." The shark was interred at a gravesite usually reserved for ex-porcupines and other road kills.

Live basking sharks are common in the North Atlantic, where they are often seen swimming lazily — apparently 'basking' — near the surface. In summer, they sometimes come too close to shore and get stranded in fishing nets. In the past, the enormous decaying bodies of basking sharks were sometimes mistaken for sea serpents.

Although most are smaller than 10 m, sharks of this species can reach up to 15 m in size. In fact, basking sharks are the second largest fish after the whale shark. They are much larger than the great white shark of *Jaws* fame. Unlike

slit them open for their livers, from which oil is extracted for commercial use. The rest of the carcass is usually thrown overboard.

Very little is known about the basking shark's life cycle. They are known to be live-bearers, but



Michèle Steigerwald made the arrangements for burying the shark in the Mer Bleue Conservation Area.

their ferocious relative, however, they pose no danger to passing ichthyologists.

The basking shark is a peaceful 'filter-feeder'. It cruises the surface at a leisurely two knots, with its huge mouth open like a dragnet. Its gill-rakers sieve out plankton — tiny shrimp-like copepods, arrow-worms and the eggs of other fishes. The shark has to work for a square meal, processing almost 2000 tonnes of water an hour.

Basking sharks don't make very good eating themselves. Fishermen

scientists are uncertain as to what age the sharks are sexually mature.

Coad hopes the giant shark will someday make an impressive exhibit in the Museum. Séguin's team is waiting for the go ahead to begin making a model. If the project is approved, it will take at least nine months to create a life-like replica from fibreglass and synthetic resins.

As to the original, Coad says: "It's safely buried now and we hope never to see it again."

Cecilia Blanchfield

# Fossil Plants of Petrified Forest National Park

Although fossil plants are found in many localities throughout the world, as well as in rocks of differing ages, one of the best known areas containing such plants is the Petrified Forest National Park in east-central Arizona. While it is today a bleak mixture of badland and desert, approximately 200 million years ago this area was a low-lying, hilly plain covered by luxuriant vegetation through which streams meandered.

Lakes and swamps also formed, and there was abundant animal life, including the earliest dinosaurs. This period, called the Late Triassic, was characterized by tropical to subtropical climates with abundant rainfall — conditions very similar to climates of the Southern Hemisphere today. In fact, many of the fossil plants from the Petrified Forest resemble certain living plants found today south of the equator. None of these fossil plants resemble or are closely related to plants that now grow naturally in the Petrified Forest.

Tree fossils in the park range in size from small fragments to trunks 30 m in length and 3 m to 4 m in diameter. Some of the largest trunks were studied by paleobotanists many years ago. Since they had a similar internal structure to *Araucaria*, a genus of living coniferous trees prevalent in the Southern Hemisphere (the Norfolk Island Pine is a well-known representative), these fossil trunks were

*Itopsmeda vanceavii* probably looked very similar to living tree ferns.

named *Araucarioxylon arizonicum*, meaning Araucaria-like wood from Arizona. Reinvestigation, however, has disclosed that these fossil trees were not closely related to living *Araucaria*. Part of the problem in comparing the fossil trees with living trees is that the leaves and cones, although abundant throughout the park, are not found connected to the fossil branches.

Some non-tree fossils found within the park include early ancestors of the living plants called scouring-rushes or horsetails. Today the horsetails are small plants, usually less than 1 m tall, although tropical forms may grow to more than 3 m. However, during the Triassic Period (about 225 to 190 million years ago), the horsetails were normally much larger than they are today, growing to 6 m or more.

Ferns were common in this ancient environment, and most were low, bushy forms similar to the species found today in north temperate environments. Some living tropical species however have large, woody stems (as do trees) and are thus called "tree ferns." One fossil fern, *Itopsmeda vanceavii*, reached heights of 1.5 m to 3 m and probably looked very similar to the tree ferns which now grow in the tropics.

Cycads are another group commonly found in the park. Today the cycads have a limited distribution in certain tropical and warm temperate regions, but during the Jurassic and Cretaceous periods (about 190 million to 65 million years ago) they were frequently the

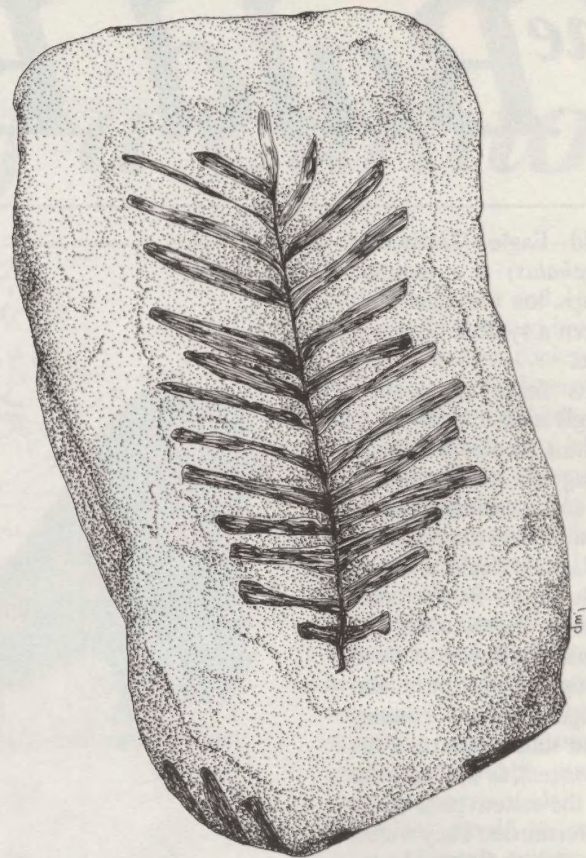
dominant form of plant life. These fossil cycads were similar in form to most living cycads, which have a short and squat stem about 30 cm in diameter, from which several long, graceful leaves grow upward and curve outward; they look like giant pineapples. The fossil leaf of *Zamites powelli* is virtually indistinguishable from those of species belonging to the living genus *Zamia*, which is found in tropical North and South America and the West Indies.

Other fossil plants discovered within the park are seldom seen except in special exhibit areas. This is because these plants are either extremely rare or so delicate that they disappear (through the drying effects of the sun) soon after exposure. Others are so small that they cannot be seen without the aid of a microscope.

Several forms of fossilized pollen grains and fern spores have been extracted from the Triassic sediments of the park. Conifer pollen is by far the most common, but cycad pollen and fern and horsetail spores have also been recovered.

The larger trees and tree ferns covered low, rolling hillsides overlooking streams, lakes and marshes where cycads, ferns, horsetails, and many other as yet unidentified plants must have flourished. The fossil plants of Petrified Forest National Park provide us with a permanent record of this once lush and diversified vegetation — a stark contrast with today's arid landscape.

David M. Jarzen  
Paleobiology Division



Leaf of *Zamites powelli*, one of the most common leaf fossils found in Petrified Forest National Park.

## From the Director's Desk

"A penny a pinch." "Pinching pennies." There are probably dozens of similar expressions. Recently all of them have been on my mind because our museum is attempting to acquire a magnificent collection of minerals. It includes exceptional "natural abstract sculptures" in gold and silver, and a glittering array of some of the most astounding crystals you can imagine. Every colour of the rainbow, and some that are not in the rainbow, are represented. More species of minerals are present in this collection than the entire National Collection of Canada contains. The research potential is astounding: ten times as many type specimens (that unique specimen that for all time serves as a reference for the definition of the species) as the whole of the Museum's collection, and crystalline forms of most species that are often the best known specimens of the species in the entire world. Comprised of nearly 16,000 specimens, it has been described as the world's best collection of minerals ever put together by a single individual.

Our chance to get this collection is very good indeed, and has been the focus of a major effort by the Museum. The purchase price is \$5,000,000; a great deal of money, and far more than the Museum could ever afford to pay for any acquisition, especially considering that our acquisition budget is only \$75,000 per year. Even if we were allowed to save it up (which we cannot), it would take 67 years, and I doubt very much that the owner would wait that long. So our initiative was to begin the Museum's first major fund-raising effort.

The response has been wonderful. Beginning with the mining sector, the campaign assembled a

stellar group of Trustees to assist us in raising the money. The organization of the campaign took nearly a year. We began asking for donations in March 1988, and nine months later had received a total of \$2,900,000 in cash and pledges. These donations came from over 140 corporations and individuals. Needless to say, there is still a long way to go. We have made the first payment and two more are due in June of 1989, and 1990.

The reason why the word "penny" is in my mind a lot just now is that we need a great many pennies to complete the campaign. In fact, it would be a stack of pennies nearly nine million feet high, the equivalent of more than 400 CN towers stacked one on top of the other. The top of the pile would be over 20 times as high as commercial airplanes go.

As for the word "pinch," there are two reasons for that one. First, we have been pinching pennies from many parts of the Museum to add to the private sector donations. Second, and most important, the man who assembled this magnificent collection is named William Pinch. He began the collection when he was seven years old, and has been working on it for over 40 years. It became a full time occupation, and has been an all-consuming part of his life. At the National Museum of Natural Sciences, we hope it will soon become a part of our lives, and those of all Canadians.

If you would like to make a donation and become a part of the support for the Pinch Collection, please send a cheque made payable to "The Pinch Acquisition Trust Fund" to the Museum. Your donation will be acknowledged and a tax receipt issued.

Alan R. Emery  
Director



David M. Jarzen, Paleobiology Division